



Division of Agricultural Sciences
UNIVERSITY OF CALIFORNIA

CITRUS FRUIT

FOR THE

HOME ORCHARD

J. C. JOHNSTON



CALIFORNIA AGRICULTURAL
Experiment Station
Extension Service

CIRCULAR 409
REVISED



Citrus fruits can be grown on home grounds over a large part of California. They can contribute substantially to your food supply, and with relatively little effort. They have excellent food value and, unlike most fruits, can be stored on the trees over long periods without the loss of nutritional qualities.



IF YOU NOW HAVE A HOME CITRUS ORCHARD—

This circular tells you how to care for your trees for maximum production:

Irrigation	Page 3
Fertilization	4
Pruning	4
Tillage—Diseases	6
Pest Control	7
Frost Injury—Harvesting	8
Storage	9

IF YOU ARE THINKING OF PLANTING CITRUS TREES—

This circular helps you in the selection and management of young trees:

Choosing trees and planting.....	Page 9
Care of trees	11
Varieties grown	13

THE AUTHOR:

J. C. Johnston is Extension subtropical horticulturist at the University of California, Riverside.

REVISED OCTOBER, 1956

Caring for a mature orchard

IRRIGATION—the most important single factor

Area of application

The area of soil occupied by roots should be supplied with moisture at all times, but excessive use of water may cause root decay, especially if drainage is poor. Normal citrus trees extend their roots well beyond the area covered by foliage; a circle twice the diameter of the tree top will contain most of the roots. Irrigate all of this area except soil which comes into contact with the bark of the trunk. Keep this as dry as possible to avoid bark decay.

Method

Water may be applied in furrows or basins or by sprinklers. The important thing is to wet as much of the root area as possible. If the soil or water contains injurious amounts of alkali, use either basins or sprinklers to prevent accumulations of salts in the soil. Apply enough water at each irrigation to wet all of the soil down as far as the roots go. In most

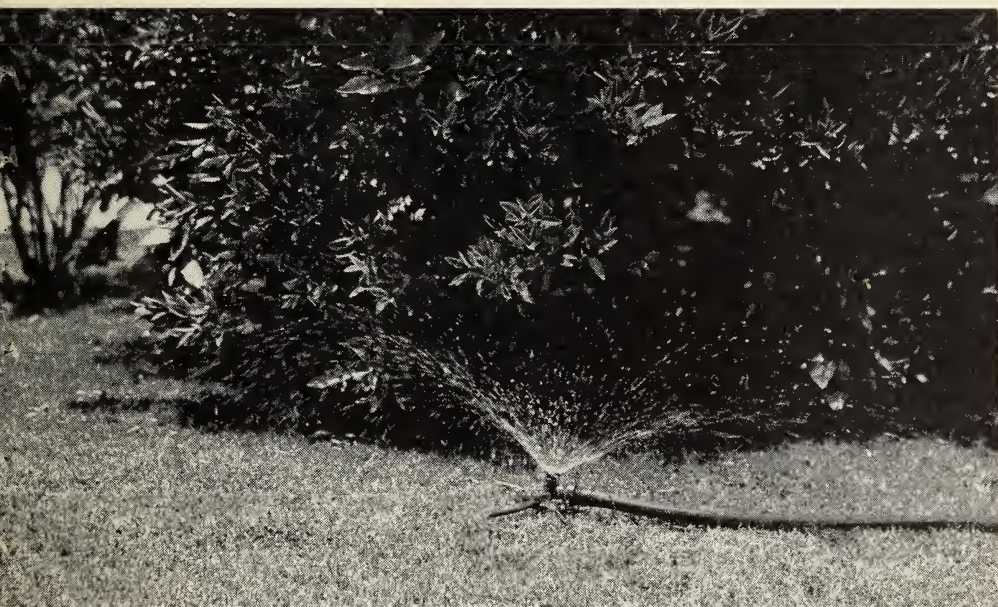
soils this will be 3 to 4 feet and will require enough water to cover the soil 3 to 5 inches deep, less being necessary for a sandy soil than for a clay soil. You can check water penetration by digging a small hole 3 or 4 days after irrigation.

Time

Apply water as often as the soil approaches dryness, less often on clay soil than on sandy soil and less often in spring and fall than in the heat of summer. *Never* irrigate *wet* soil. *Always* irrigate *dry* soil. In cool coastal areas, 4 or 5 irrigations per season will be enough; in hot interior areas, 7 to 10 will be needed. Continue irrigation in the fall until adequate rains occur.

When trees are situated on lawns, it is difficult to irrigate properly. Grass has shallow roots and requires frequent light sprinkling. You can keep the trees in fairly good production by giving the grass only as much water as it needs and by heavily watering the trees at 3- to 6-week intervals.

A lawn sprinkler offers the best way of irrigating trees on the home grounds.



FERTILIZATION—supply nitrogen, perhaps zinc

Nitrogen

Fertilization is necessary on most soils but fortunately the only element which is commonly lacking is nitrogen. This can be supplied by animal manures or by commercial fertilizers.

If poultry or rabbit manure is available, use 50 to 75 pounds per tree; spread it over all of the root area. If you use a good grade cow manure, apply 100 to 200 pounds. Manures give best results in the fall or early winter, but can be used as produced if animals are kept on the premises.

The most desirable sources of nitrogen are such chemicals as

- sodium nitrate,
- calcium nitrate,
- ammonium nitrate, and
- ammonium sulfate.

Use 5 to 10 pounds per tree and apply before spring rains are over. Better still, divide this amount into 3 or 4 lots. Apply the first in January or February and the balance at about monthly intervals just before irrigation. Spread all fertilizers evenly over all of the root area, and do not place them in piles or lumps. Where furrow irrigation is used, fertilizer applied after the rainy season should be spread in the furrow bottoms so it will be carried down by the water. Best results will be obtained if both manure and chemical nitrogen are used.

If citrus trees are growing in a lawn, it is difficult to give them an adequate supply of nitrogen without excessive stimulation of the grass. The grass often takes most of the nitrogen, leaving little for the tree. Under these conditions a spray of urea can be used.

Apply a foliage spray containing two heaping tablespoons of urea (1 ounce) per gallon of water. Use material prepared especially for use as a spray and do not exceed the amount recommended. Larger amounts may cause serious leaf

injury. Apply the spray 3 or 4 times a year, or as often as a slight yellowing of the leaves indicates a need for nitrogen.

Zinc

The only other element which citrus trees in home grounds are likely to lack is zinc. Zinc deficiency causes the nutritional disease known as mottle-leaf. The leaves become yellow between the veins and are smaller toward the end of the twigs. In severe cases, the ends of the twigs die back.

Zinc can be supplied to the trees most economically by spraying it on the leaves. It can be used at any time, but late winter and early spring are the best periods. Zinc-bearing dusts can be used but are much less effective than sprays and are not recommended.

To prepare zinc sprays, use 1 ounce of zinc sulfate and 1 ounce of washing soda per gallon of water. If washing soda is not available, use $\frac{1}{2}$ ounce of hydrated lime instead.

Another convenient and effective spray can be prepared by adding 1 ounce of zinc oxide to 1 gallon of water. Occasionally this spray causes a pitting of leaves, but fruit is not usually affected.

It is not necessary to drench the tree to get results, but some spray should reach all of the leaves. Three to 5 gallons will be ample for most mature trees.

Phosphates

Citrus trees may require fertilization with phosphate on certain soils. The extent of this deficiency has not been determined. The use of phosphate is not recommended except where local experience has demonstrated its value. If manure is used, phosphates are seldom needed. Consult your County Farm Advisor for additional information.

PRUNING—confine it to dead and broken limbs

Pruning of citrus trees grown for fruit production should be confined almost entirely to the removal of dead and broken



This is the normal shape of a citrus tree. You need not prune to get this shape.

limbs. The removal of green leaves reduces the ability of the trees to bear fruit and should be avoided as much as possible.

For the sake of appearance and to facilitate tree care, all growth may be removed from the tree trunks. Remove enough growth from the center of the tree to facilitate fruit picking and pest and disease control. Citrus trees normally produce long, vigorous sprouts called suckers. Remove them if they are not well placed, but leave them, whenever possible, to build up the tree. Pull them out to the sides of the tree to tame their wild growth and increase the leaf area of the

tree. If left alone, they tend to fill the top and center of the tree with a tangle of brush.

Do not remove low-hanging branches; they bear fruits which are within easy reach, and shade the ground so weeds do not grow under the trees. The ideal tree has a skirt of foliage extending clear down to the ground.

Lemons need more pruning than oranges. With young lemon trees it may be desirable to remove or cut back some of the more vigorous shoots. A moderate annual thinning of mature trees will reduce the crop and improve the size and quality of the fruit.

TILLAGE—*is necessary but keep it to a minimum*

Weeds and grass compete with trees and should be kept under control, at least during the growing season. You may accomplish this by

cultivating the soil,

keeping the weeds down with a hoe, or a light spray of Diesel oil or other contact weed killer.

Cultivation is injurious to soil. Limit it to the amount necessary to keep weeds under control, to make irrigation furrows or basins, and to cover manure or other similar fertilizer material. Avoid all deep tillage because it cuts roots. Remember that unlike annual crops, tree roots grow in the untilled part of the soil.

Spraying may help

Keeping weeds under control by frequent hoeing avoids stirring the soil but involves a lot of hard work. An easier way to accomplish the same result is to spray the weeds with oil. A considerable area can be kept under control by this method with only a 2- or 3-gallon hand pressure sprayer. The soil is first prepared for irrigation and then as weeds come up 1 to 1½ inches in height, they are sprayed lightly with a suitable weed killer. Use these materials sparingly and do not permit them to touch the tree trunks or foliage.

You can avoid injury if the weeds around the trunk are destroyed by hoeing. Apply the weed killers as a fine mist and use only enough to wet the weeds. Avoid letting them accumulate and run down the stems. Do not attempt to control heavy weed growth with these materials. Catch it young and keep it down. A number of proprietary weed-killing sprays are now on the market. If applied according to directions of the manufacturer, any one of them can be used effectively.

DISEASES—*some are incurable but they can be avoided*

Scaly bark

The most common disease affecting citrus is scaly bark, a virus disease carried by buds when the trees are propagated. It causes rough scaly areas to develop on the trunk or main limbs. Small amounts of gum are usually produced in affected areas. These symptoms seldom appear until the trees are mature. Affected trees gradually decline in vigor and productiveness. No cure is known. In most cases the practical thing to do is to keep the trees until they are too weak to produce satisfactory crops and then destroy them. This disease is serious in orange, grapefruit, and tangerine trees but can be carried by all varieties of citrus. It can be avoided by planting trees from registered scaly bark-free parents.

Gummosis

Gummosis is a fungus disease which causes the bark to die, beginning in most cases at or near the ground level. Large amounts of gum usually flow from affected areas. The fungus which causes the disease (a species of *Phytophthora*) is present in practically all soils, but does not usually attack trees which have been properly planted and given good care. The disease occurs most often where wet soil remains in contact with the bark for some time. The disease is most common in clay soils because they dry more slowly than sandy soils.

Cleopatra mandarin and trifoliate orange are resistant to this disease and should be used as rootstocks in clay soils and in wet locations. The bark on roots is more resistant to attack than the bark on the trunk. For these reasons plant your trees so that the first roots branch out at the ground level. With trees already planted, keep the soil away from the trunk down to the level of the first roots. A thin wash of commercial Bor-

deaux powder mixed with water and applied to the trunk and exposed roots in the fall will give added protection.

If a tree becomes infected, remove the soil down as far as the bark is diseased and determine the extent of the injury. If the bark has been killed more than half of the way around the trunk, it will be best to remove the tree and plant a new one. If half or more of the bark is still sound, carefully remove the part which has been invaded by the fungus and one-fourth inch of sound bark around the margins. Bark which is alive may be yellow and gummy next to the wood. Remove only parts that are brown and discolored. When the job is complete, disinfect the wound with one teaspoonful of potassium permanganate to a pint of water. Do not replace the soil.

When the bark shows signs of healing, cover the wound with any good wound compound.

Fruit drop

The dropping of immature fruit is a common problem with citrus growers. Normally there is a fairly heavy drop of small fruit beginning shortly after the blossoms fall, and continuing until the fruit is half an inch or more in diameter. This is nature's way of adjusting the amount of fruit carried by the trees to their environment. The whole crop often appears to have fallen, when, in fact, a good set of fruit remains.

Excessive drop may have a number of causes. Among them are lack of moisture or fertility, heavy pruning, and sudden changes in temperature. Other reasons are insect infestation or injurious sprays used to combat insects. Some of the dropped fruit is infected with a fungus called *Alternaria*. No way has been found to control this disease, but it is seldom a serious matter.

In home orchards the fruit is often left on the trees long after it is mature. There is no better way to store fruit, but the continued maintenance of the old crop

reduces the ability of the tree to bear fruit the following year and in many cases is a cause of reduced yields. Anything that injures or weakens the trees will decrease the set of fruit.

It is not always possible to avoid excessive fruit drop, but it can be kept to a minimum by giving the trees the best possible care. It is especially important to irrigate carefully, avoid excessive pruning and keep pests under control.

Quick decline

Quick decline is a virus disease affecting sweet oranges and grapefruit grown on sour orange and certain other rootstocks. The disease has few definite symptoms but is characterized by root decay which begins at the root tips and progresses back to the larger roots. This is accompanied by symptoms in the top resembling those produced by gopher injury or gummosis. The tree may die within a few days after the first symptoms are observed, but more frequently the decline occurs over a period of several months. Sweet orange, mandarin orange, and trifoliate orange are among the stocks that can be used for replanting where this disease is present. The County Farm Advisor, once again, is your best source of information.

PEST CONTROL—check with your Farm Advisor

Citrus trees are attacked by a wide variety of insects and other pests, and methods of control must be fitted to the pest or combination of pests as well as to the particular locality. It is therefore best to call or write your County Farm Advisor or Agricultural Commissioner about pest-control problems. The County Farm Advisor is the local representative of the University of California College of Agriculture and the United States Department of Agriculture. The Agricultural Commissioner is head of the County Department of Agriculture and repre-

sentative in the county of the California State Department of Agriculture. No general outline of methods will give satisfactory results. Communications will reach these agencies if addressed to your county seat.

Here is a list of pest control materials suited to use in home orchards. Use them according to the manufacturer's directions. These materials are not good for trees and should be used only when necessary to control pests.

<i>Material</i>	<i>Pests</i>
1. Petroleum oils— light medium or medium grade	Scale insects Mites
2. Malathion	Scale insects Mites Aphids Mealybugs Thrips
3. Aramite	Mites
4. Ovotran	Mites
5. Nicotine sulfate	Aphids
6. DDT	Leaf-eating insects Orange worm Leaf roller Cut worms Katydids Rose weevils

FROST INJURY—prune only after you know the extent of injury

Citrus trees in many sections of California occasionally suffer serious injury from cold. It is impossible to determine the full extent of a severe injury for several months. In cases of severe injury to large trees, the dying back may continue during an entire season following a freeze. During this period little can be done and treatment should be postponed.

If only twigs and small limbs are killed, you may prune as soon as new growth indicates the extent of the injury. When trees have been killed back to heavy wood, do not prune for 6 months to a year after the freeze. Always allow sufficient time for new growth to take

place and for the dying back to cease so that the extent of the damage is clearly defined. Earlier pruning usually results in leaving some limbs which will continue to die back, and the removal of limbs which would recover.

In the meantime, remove fruit which has no value, and limit the use of water to the need of the tree. In cases of severe injury reduce the normal amount of fertilizer.

HARVESTING—handle fruit to be stored with the greatest care

Citrus fruits can be left on the tree for considerable periods of time without deterioration. Whenever possible this is the best method of storage. They are, however, subject to damage by wind and frost and eventually they become overripe and unpalatable. For this reason the fruit is sometimes picked and stored for future use. The fruit, if uninjured, is resitant to decay and can be kept for several weeks if properly handled and stored. The longer the fruit remains on the tree after maturity, the shorter the time it can be kept in storage.

Citrus fruits which are to be stored must be harvested and handled with the greatest of care. Any break in the rind will open the way for decay organisms. Always wear soft gloves when picking or handling the fruit, for it is almost impossible to avoid cutting the rind with fingernails when bare hands are used. Do not pull the fruit from the tree, but clip the stem with a close, smooth cut. Rough or long stems puncture other fruits during handling. Use clippers with care, for clipper cuts and bruises are a frequent cause of decay. Avoid scratching the fruit on thorns or dead brush and do not drop the fruit when putting it into bags or boxes. When it is being transferred from one container to another, pour it carefully. See that all containers are free from twigs and gravel which might damage the rind. Pick the fruit when it is thoroughly

dry. Wet fruit is more easily damaged than dry fruit.

STORAGE—in uniform temperature about 60° F

Citrus fruits keep best in cool rather than cold storage. Temperatures in the neighborhood of 60° F are satisfactory. Choose a place where the temperature is or can be held at a fairly uniform level.

Do not attempt to store fruit that has been injured; remove any that shows de-

cay during storage. A few bad fruits will hasten deterioration in the whole lot. The less citrus fruit is handled the better it will store.

Place the fruit in convenient containers (clean wooden boxes are usually best) and get it into storage as soon as possible after picking and with a minimum of handling. Fruits may be stored bare or wrapped individually. Wrapping tends to isolate decaying fruit and prevents the withering that may occur if the air is too dry.

Starting a new orchard

CHOOSING TREES—go to a reliable nursery

Citrus trees are grown on a number of different rootstocks. The most desirable for oranges, grapefruit and mandarins are sweet orange, Troyer citrange and Cleopatra mandarin. Oranges and mandarins may also be grown on trifoliate orange root. On this stock most trees are somewhat dwarfed, a very desirable characteristic for many home orchards. Sweet orange, Sampson tangelo and Cleopatra mandarin are suggested as stocks for lemon varieties. On clay soils Lisbon lemons do well on sour orange root.

Not recommended for oranges and grapefruit is sour-orange stock. Sweet oranges on sour-orange stock may be destroyed by the virus of quick decline disease. Grapefruit on sour-orange stock—to a lesser extent—is also affected.

In the nursery the varieties are budded on suitable rootstocks and grown for one or two years. Either one- or two-year-old trees are satisfactory; avoid older ones as they are likely to be culls.

Well-grown one-year-old citrus trees should be $\frac{1}{2}$ to $\frac{3}{4}$ inch, and two-year-olds $\frac{3}{4}$ to 1 inch in diameter, measured 1 inch above the union of the bud and the rootstock. The trees are sold balled, wrapped in burlap. Reject trees on which

the soil has been broken away from the roots by careless handling.

Certain virus diseases, not easily detected in the nursery, affect citrus trees. To avoid them make sure your nurseryman has used buds that have been registered by the state nursery service as free from scaly bark.

Purchase trees from experienced and reliable nurserymen, because in most cases it will be necessary to take the word of the nurseryman as to their quality. Trees which are not acceptable to experienced growers are often left standing in the nursery until they are finally large enough to sell.

PLANTING—watch out for these factors

Soil

Citrus trees do best on well-drained loam or sandy loam soils. With good care, though, they can be made to produce on almost any well-drained soil that does not contain injurious amounts of alkali.

Time

Planting can be done any time after the danger of frost has passed. Early planting is especially desirable in the in-

Buy this . . .



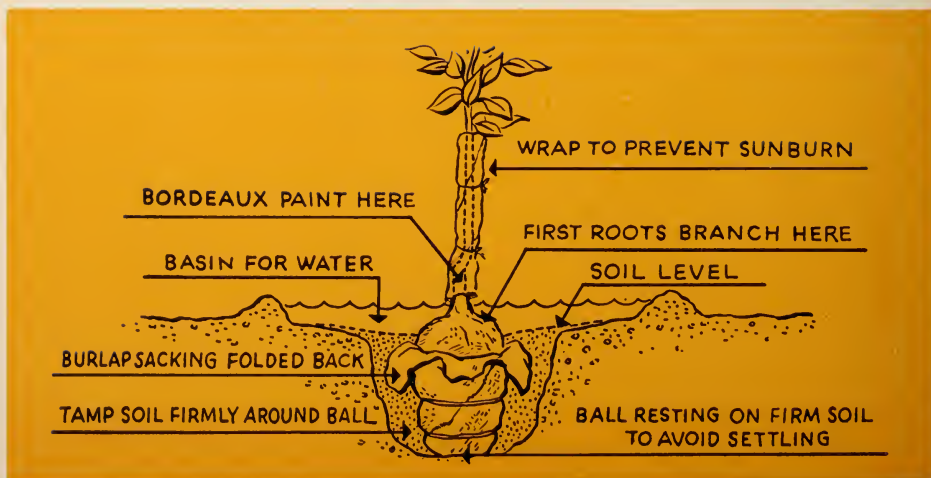
This tree is less than two years old.

. . . Not this



Top-growth on this tree indicates advanced age.

Plant it correctly



terior areas, where sudden hot spells are likely to damage trees that are not well established. In most regions, April or May is a good time to plant.

Spacing

In commercial orchards the trees are commonly planted 22 or 24 feet apart; in home grounds much closer planting is often desirable or necessary.

Planting

Holes for planting the trees need be only deep enough to accommodate the ball and wide enough to permit easy filling. If holes are unnecessarily deep, there will be excessive settling after planting. On poor soil dig large holes and fill back with good top soil, then allow the new soil to settle 2 or 3 months before planting.

The balled trees are placed in the holes without removing the sacking. Plant them so that they will finally be a little higher than in the nursery, with 2 or 3 inches allowed for settling. Try to have the uppermost roots branch out at about ground level, after the trees have settled. These precautions are important because trees set too deep are likely to be killed by brown rot gummosis, which frequently develops where the soil comes into contact with the bark.

Irrigation

When a tree is properly placed, fill the hole three-fourths full of soil, and tamp it firmly around the ball. Next release the sacking which covers the ball, fold it back so as to expose the top of the ball, and complete filling the hole. Throw up a small basin around the tree and irrigate thoroughly. The bottom of the basin should slope toward the tree trunk, so that most of the water goes into the ball. As an added precaution against gummosis paint the lower 6 or 8 inches of the trunk with a Bordeaux wash. Use plenty, so that some of it soaks into the soil around the tree. Use Bordeaux powder and add water to make a mixture about as thick as paint.

Sun protection

To protect the trees from sunburn during the first year, wrap the trunks in several thicknesses of newspaper and tie loosely.

Fertilization

It is sometimes recommended that fertilizers be placed in the hole when the trees are planted. This practice has frequently resulted in severe damage to the trees. Fertilizers can be more safely applied to the surface of the soil after the trees have been planted.

Cross Pollination

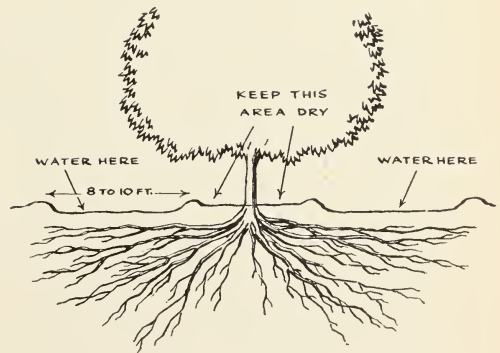
With the exception of Clementine mandarin, citrus trees do not need cross pollination and can be grown as single trees.

CARE OF TREES—watering is most important

Watering

The most important point in caring for young citrus trees is to see that they get plenty of water. Under most conditions, water every week or 10 days during the first year, and about every 2 weeks for the next 2 or 3 years.

After the third year, trees will require irrigation every 2 to 6 weeks, according to soil and locality. On sandy soil or in hot weather, irrigation must be more frequent than on clay soils and in cool weather.



For the first year, the best way to apply water is in basins of about 2 feet in diameter around the trunk of the trees and deep enough to hold 3 or 4 inches of water. When the trees are established, water may be applied in furrows or basins or by sprinklers. After the first year, enlarge the basin and keep water away from the trunk of the trees as much as possible to avoid gum disease. This can be achieved with an inner circular ridge of soil around the trunk, and one to two feet from it.

Cultivation

Cultivation is necessary only to maintain irrigation furrows or basins and to control weeds and grass, which compete with the trees for water and fertility. It is not beneficial of itself and should be kept to a minimum.

Pruning

Avoid pruning young trees as much as possible. The removal of green leaves retards growth and increases the time required for the trees to come into bearing. For the sake of appearance, rub off growth on the tree trunk while young and succulent, but leave the tops unpruned until the trees are in bearing.

Frost Protection

Young citrus trees are likely to be damaged by frost and in most regions must be given protection for the first two or three winters. The most common method is to wrap the trunk and main branches in some material such as cornstalks. The wrapping should be 3 or 4 inches thick and snug enough to prevent free access of cold air to the trunk. Cover only the trunk and main limbs and be sure the wrapping makes good contact with the soil. Trees are fed by materials produced in green leaves in the presence of light. Therefore, if the leaves are covered or shaded, the tree is starved and becomes more liable to cold damage. It is better to risk injury to the leaves by frost than to cover them and starve the

tree. Examine the wrapping occasionally to see that it remains in place.

When there are only a few trees, a cover can be thrown over them at night and removed during the day. On very cold nights, a lighted lantern or plumber's candle placed under the cover will give excellent protection.

Fertilization

On most soils, young citrus trees will grow more rapidly if given a fertilizer carrying nitrogen. Such sources as ammonium sulfate, sodium nitrate, calcium nitrate, and ammonium nitrate are good suppliers of nitrogen. Sprinkle a heaping tablespoon of chemical nitrogen in the basin around each tree three or four times during the season just before irrigation. Double this amount the second season. The better grades of animal manures can be used with good results. Apply about a gallon three or four times during the season as directed above. In applying fertilizer to young trees, remember that the root system is small and excessive use of concentrated fertilizer will cause damage. Keep fertilizer from coming into direct contact with the tree trunk, and scatter it well in the basins.

Insect control

Young citrus trees are especially susceptible to damage by aphids, thrips, and red spiders. Aphids are controlled by spraying with nicotine sulfate (1 teaspoonful to 1 gallon of soapy water) or by dusting with a 10 per cent nicotine dust as often as they appear.

Thrips are light yellow insects about $\frac{1}{30}$ -inch long. They feed on young foliage and fruit and cause retarded growth, distorted foliage, and scarred fruit. They do not appear as pests in coastal areas. Thrips can be controlled by a spray of malathion (use as directed on package), or of nicotine sulfate and sugar. For the nicotine spray, use 2 teaspoonfuls of nicotine sulfate and 2 teaspoonfuls of sugar to 1 gallon of water. For best results make three applications: one when

spring growth is about 2 to 3 inches long, one when the petals are falling (about May 10), and one in August.

Red spiders are common on citrus trees. They are difficult to see but their work causes leaves and fruit to take on a

light grayish-green color. This injury weakens the trees and may result in leaf and fruit drop and in reduced tree growth. For control, spray with a light-medium oil emulsion according to the manufacturer's directions.

The varieties grown

• ORANGES •

Washington Navel orange—an early variety, maturing December to February, depending on location. Does not develop its best quality near the coast. The seedless fruit can be left on the tree from three to four months.

Valencia orange—a late variety of wide adaptation, maturing from April to June, according to location. The fruit can usually be left on the tree till September or October. In many areas, planting both Washington and Valencia will provide fruit the year round.

• GRAPEFRUIT •

Marsh grapefruit—the only variety commonly grown in California. Fruit matures from late November to June, depending on location, and can be stored on the tree for several months. The quality of grapefruit grown in cool areas is generally not acceptable; it is at its best in the warm interior areas.

Ruby grapefruit—a variety with red flesh. Very similar to Marsh grapefruit, except for the red blush of the rind and rosy red flesh. Red or pink flesh grapefruit do not color well in most parts of California, and this variety is no exception.

• LEMONS •

Lisbon lemon—vigorous, thorny, more resistant to cold than the Eureka

lemon. Matures most of its fruit in the fall, but will furnish some fruit all year round.

Eureka lemon—usually bears fruit at all seasons. Especially good as a dooryard tree, though not as vigorous as the Lisbon. Does not do well on sour-orange root.

Meyer lemon—preferred by many for the home orchard. It is a smaller tree than either the Eureka or Lisbon lemon, and is more resistant to cold. It carries fruit during most of the year. This lemon is similar to the ordinary varieties, except that it is almost orange in color. It has a mild flavor, a pleasant aroma, and high juice content.

Most Meyer lemons carry the tristeza virus and a program of eradication is now under way in areas outside the quick decline quarantine areas. For this reason it should not be propagated or planted outside the quarantined area.

• MANDARINS •

The mandarins include a large group of loose skinned, highly flavored fruits. Some members are called Satsumas, others tangerines. They are all in the mandarin classification, however.

Satsuma mandarin—Includes several strains with very similar fruit. Particularly suited to the northern limits of citrus culture, it will stand more cold than most other citrus varieties, and will mature where summers are rela-

tively cool. Not suited to the desert areas. Usually grown on sweet orange or trifoliate stock. Season is November to February, depending on location. The tree is small and thornless, rarely reaching a height of more than ten feet. Fruit is medium to small, and has almost no seeds. Rind is loose, bumpy, and yellowish orange in color. If left on the tree the fruit deteriorates rapidly after maturity, but can be picked and stored for a considerable length of time.

Dancy mandarin—More commonly called Dancy tangerine—is the most commonly grown variety in this group. The tree is vigorous and large for a mandarin. It is at its best in the desert, but is cold-resistant and can be grown under many conditions. Fruit is of medium size, with rind loose and reddish orange in color. Flesh is deep orange and excellent in flavor. Season is December to March, according to locality.

Clementine or Algerian mandarin—usually matures between Satsuma and Dancy. The tree is medium in size. Fruit is orange red, smooth, and also medium in size. It has few seeds, is of high quality, and can be left on the tree longer than most mandarin varieties.

Clementine will usually bear light crops unless planted with another variety for pollination.

Kara mandarin—a cross between the Satsuma and King mandarins. The tree is vigorous, spreading, and fairly large. Fruit is medium to large size for a mandarin, with a loose rind colored a deep orange. The flavor is excellent and it is a good juice fruit, although seedy. Well adapted to the warm interior areas. Season is January and February in the desert valleys and March to May-June at Riverside.

Kinnow mandarin—a cross between King and Willow Leaf mandarins. A vigorous upright variety. The fruit is yellowish orange and medium in size. Flavor is rich and somewhat less acid than Kara. This variety tends to produce most of its fruit in alternate years, and fruit size is often too small in heavy crop years. This can be overcome by pruning out some of the branches following a light crop. Desert valley season is December to February; Riverside, February-March to May.

Frua mandarin—a cross between King and Dancy mandarins. The tree is medium in size, and somewhat lacking in vigor. The fruit is similar to Dancy but larger, and has fewer seeds. Its season is January to February, but varies with location. It is not recommended for the desert, but thrives in the southern California navel orange areas. It is not vigorous enough on trifoliate rootstock.

Dweet—a cross between Dancy mandarin and Mediterranean Sweet orange. The tree is large and vigorous but bears alternately light and heavy crops. The fruit is about orange size, deep orange in color, and somewhat pear-shaped. The rind is loose and tends to become lumpy at maturity. The fruit is too tender to eat out of hand, but is excellent for juice. Season at Riverside is March-April to May. Subject to fruit drop in windy areas.

• OTHER VARIETIES •

Toroco—a red-fleshed orange of good size and quality. While blood oranges generally do not color well in many parts of California, this variety develops very well. At Riverside it matures at mid-season. It is practically seedless. The juice is rich dark red.

Kumquat—closely related to citrus fruits. The tree bears small orange-like fruit $\frac{3}{4}$ to 1 inch in diameter. The rind is sweet, the flesh sour. The fruit can be eaten fresh or as marmalade or jelly. They are frequently candied or preserved whole. The trees are small and can be grown as shrubs. They are excellent ornamentals. Common varieties are Meiwa, Nagami, and Marumi. Nagami fruit is oblong to slightly pear-shaped; Meiwa and Marumi are round.

Mexican limes—include a number of varieties. The trees are small and can be grown as bushes. They are very susceptible to frost, and will survive only in the most favorable of locales. The fruit is highly acid, about an inch in diameter, and is round or oval.

Bearss seedless lime—the most popular lime variety in California. More hardy than the Mexican limes, but not as resistant as the lemon. The tree is of medium size, round and vigorous. The fruit is slightly smaller than most lemons, very acid, and has excellent flavor. It bears some fruit during most of the year.

Sweet limes and lemons—There are a number of limes and lemons that do not contain acid. They are popular in many tropical countries, but lack enough flavor for most tastes here. They are interesting novelties, and have value as a source of vitamin C for those who cannot use the acid citrus fruits. Most common varieties are the Palestine sweet lime and the Dorshapo sweet lemon. The lime is a vigorous, large tree. The Dorshapo tree is of medium size, and resembles the Eureka lemon.

Tangelos—the result of crossing mandarins and grapefruit. In general, they are highly flavored, and have the characteristics of both parents. Their behavior under varied growing conditions is not known at this time. The following are suggested for trial: Minneola, Pearl, and Orlando varieties.

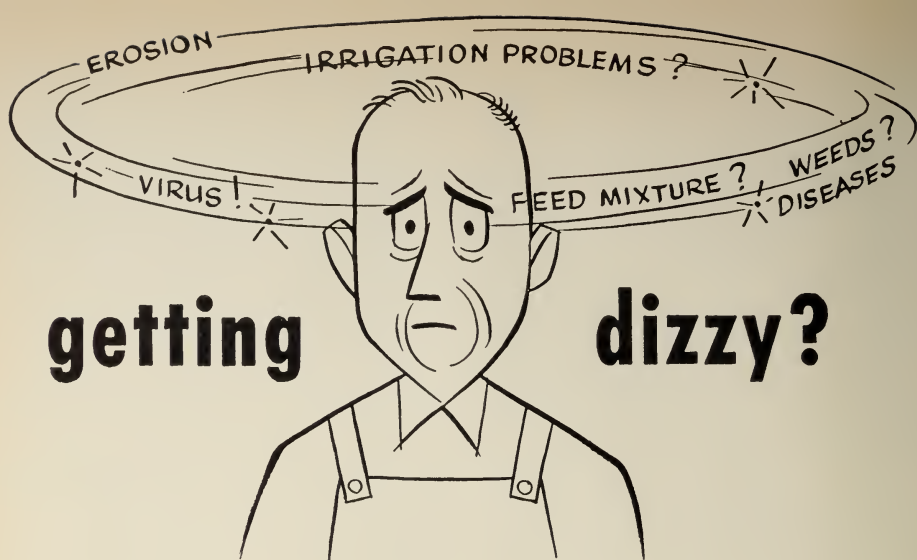
The following information applies to the desert area:

Minneola—season February-March. Color orange red. Size medium to large, slightly elongated and some neck. Rind smooth, excellent flavor, medium seeds.

Orlando—season December-January. Color red orange. Size medium, shape oblate (flattened), rind smooth, medium seeds, mild flavor.

Pearl—season December-January. Color deep yellow, size medium, round shape, rind smooth, mild flavor, many seeds.

Shaddock or Pummelo—the largest citrus fruits grown. Many varieties have been introduced in the United States, but generally have not been adapted. A few of these have produced acceptable fruit, and some in the desert have been exceptional. The fruit has a thick rind, and the pulp is usually crisp and firm. Some can be eaten like grapefruit, but most are better sectioned and peeled. The flesh can be eaten with or without sugar, and is excellent in fruit salad. No recommendations as to varieties can be made at this time. They are not suggested for the cooler areas of the citrus region.



IT JUST COULD BE . . .

that the farm problems troubling you have also troubled others.

And it's also possible that with a little help from the right source your problems can be eased, if not cured.

Here's how to go about getting help.

Take your problems to your County Farm Advisor. He's an agricultural specialist with a background of practical knowledge about farming in your locality. He will help you if he can . . . or he will get the information you need from someone who does know the answers.

Ask your Farm Advisor for a copy of AGRICULTURAL PUBLICATIONS—a catalog that lists the bulletins and circulars produced by the University of California College of Agriculture, or write to the address below.

You'll be amazed at the wide range of information covered in these publications.

Yes . . . it just could be that your problems aren't nearly as hard to solve as you think. Make use of the free services of your University.

Office of Agricultural Publications
22 Giannini Hall
University of California
Berkeley 4, California

